Epidemiology of Polypharmacy in Older Adults

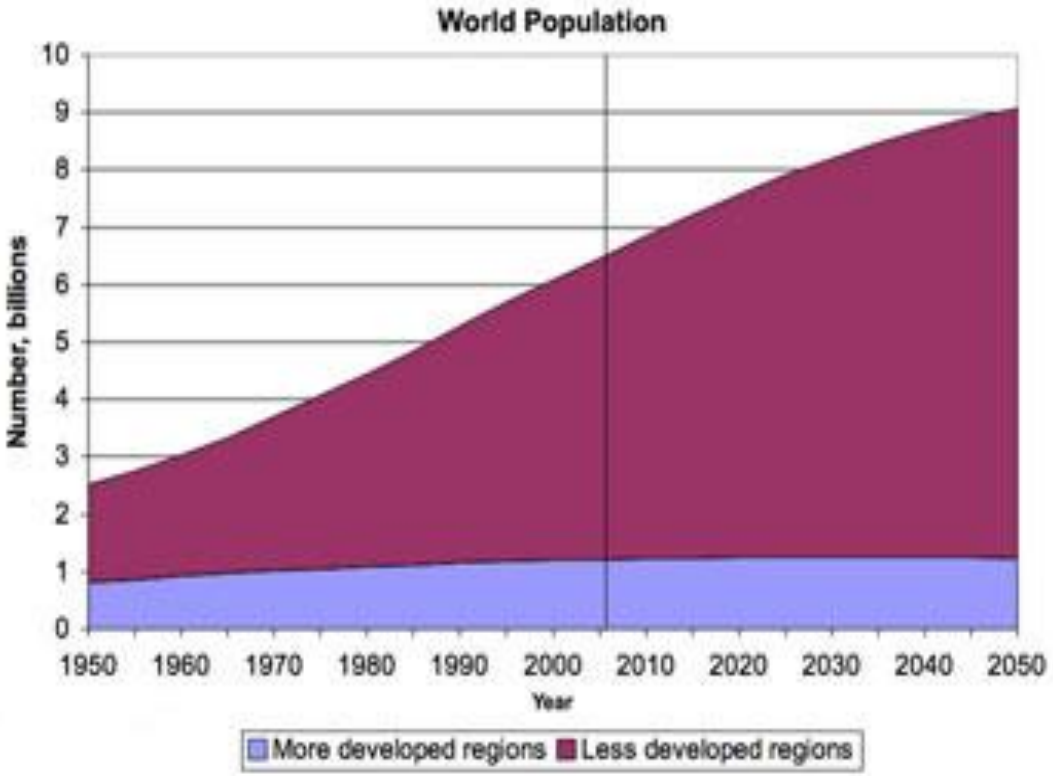


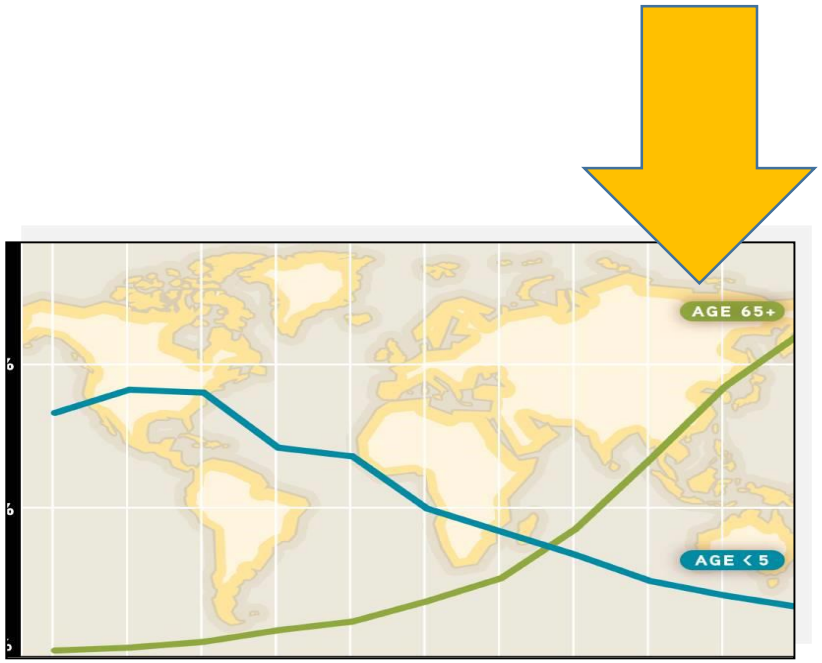
بتول موسوی: متخصص پزشکی پیشگیری و اجتماعی
پژوهشکده مهندسی و علوم پزشکی جانبازان،

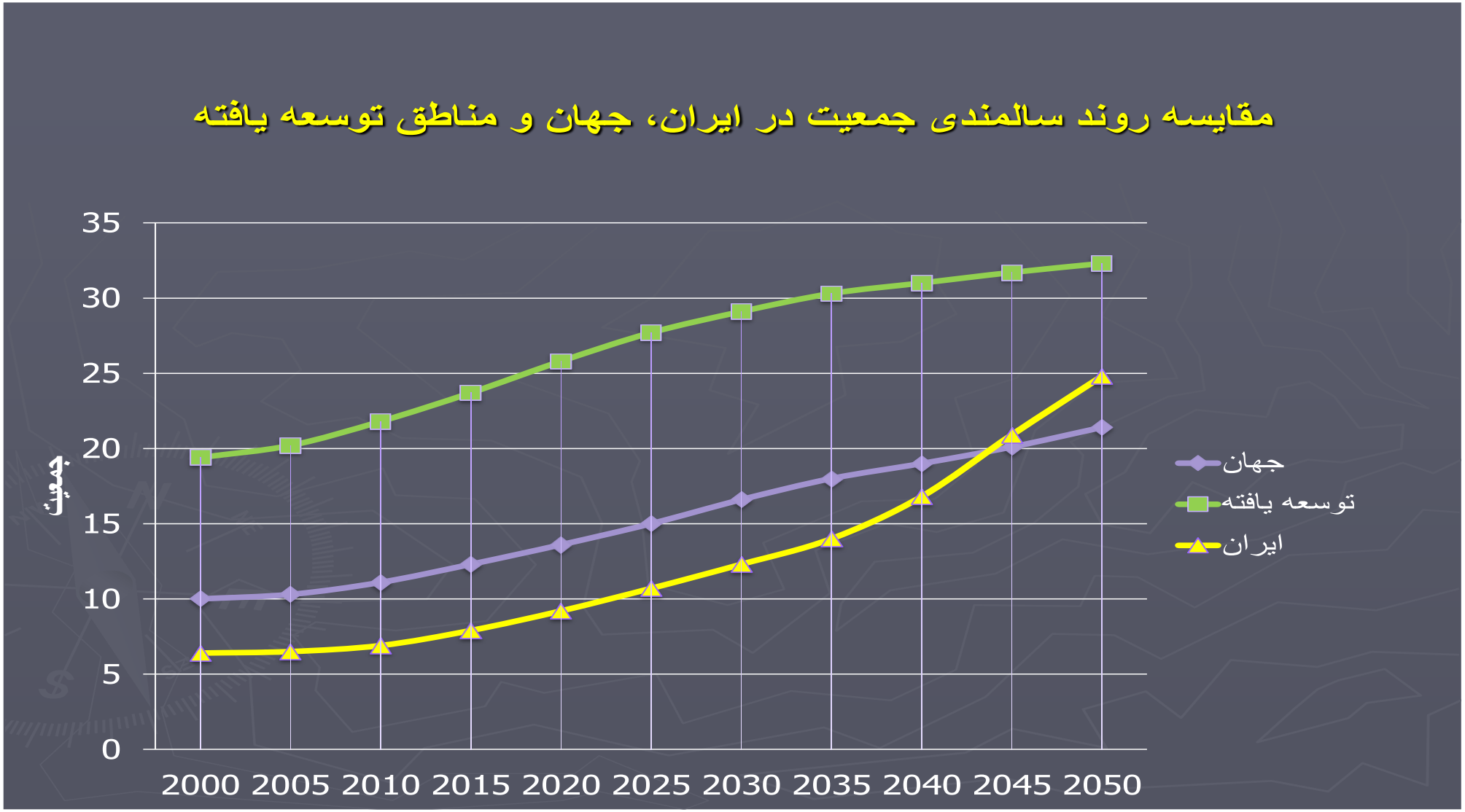
مهرماه ۱۴۰۵

Janbazan Medical and Engineering Research Center

Future of the World population






مقایسه روند سالمندی جمعیت در ایران، جهان و مناطق توسعه یافته
جمعیت
35
30
25
20
15
10
5
0
2000 2005 2010 2015 2020 2025 2030 2035 2040 2045 2050
جهان
توسعه یافته
ایران

In this presentation…



Patient +65yrs %???

- **Elderly: Future trend in global ageing**
- **Definition of polypharmacy**
- **Prevalence of polypharmacy**
- **Consequences**
- **Strategies regarding polypharmacy**

Change in the Older Adult

- **Pharmacodynamic** (Drug do in the body- dose/response& toxicity)
- **Pharmacokinetics** (body do with drug- metabolism)

Change in the Older Adult

Summary of Age-Related Pharmacokinetic Changes

Absorption	↑ gastric pH ↓absorptive surface ↓ splanchnic blood blow	↓ GI motility ↓ gastric emptying rate
Distribution	↓ cardiac output ↓ hepatic/ renal blood flow ↑ body fat	↓ TBW & LBW ↓ relative tissue perfusion ↓ albumin
Metabolism	↓ liver mass ↓ hepatic blood flow ↓ enzyme activity	
Excretion	↓ renal blood flow ↓GFR (CrCL) ↓Tubular secretion ↓ renal mass	

Question …?

How many drugs must an older person take to make him at risk for <u>polypharmacy</u>?

A. 2

B. 5

C. 10

D. More than 10



Question …?

How many drugs must an older person take to make him at risk for <u>hyper-polypharmacy</u>?

A. 2

B. 5

C. 8

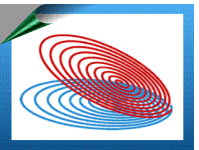
D. 10 and more than 10



Polypharmacy in Elderly

- **Definition:**
  - **Polypharmacy:** concurrent use of **≥5 medications**
- **Hyper-polypharmacy**: concurrent use of **≥10 medications**

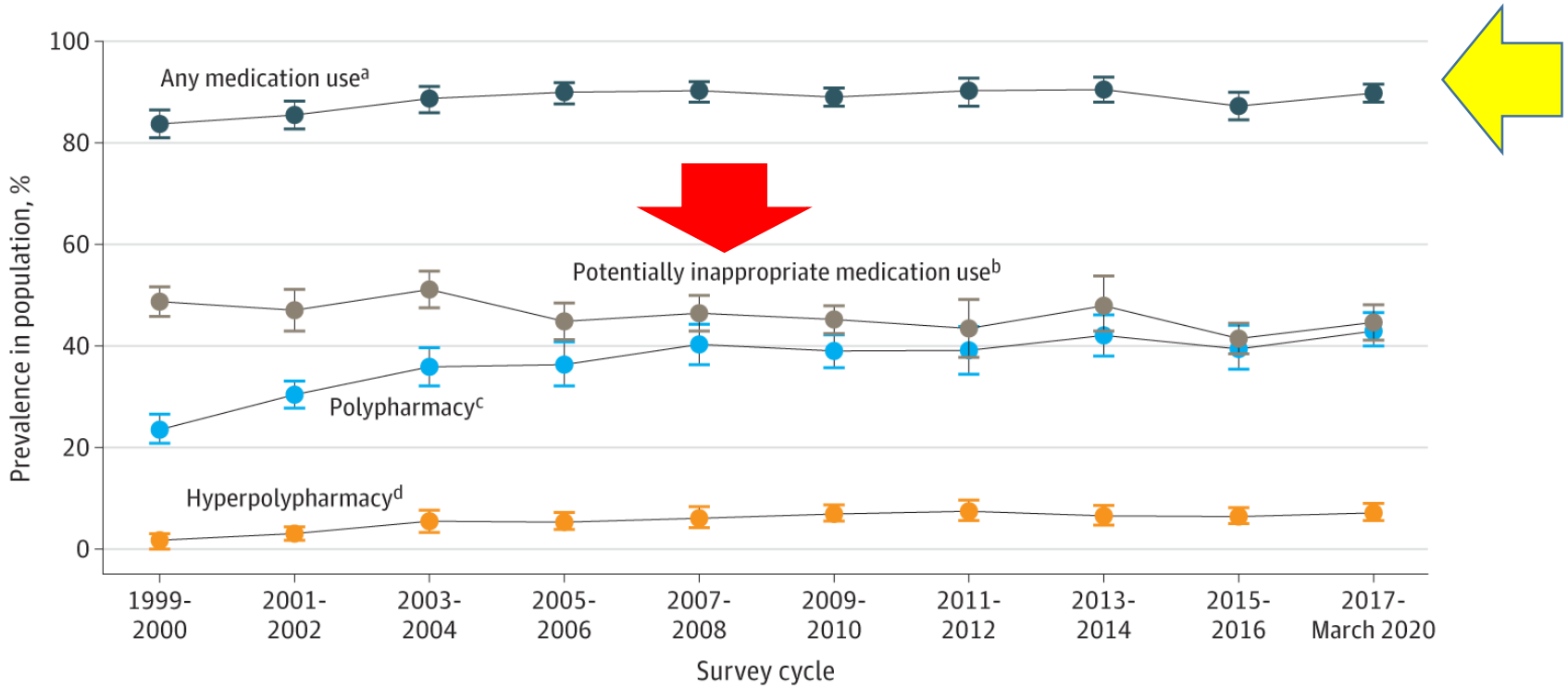
https://pubmed.ncbi.nlm.nih.gov/39135518/ 2024



JAMA Network™

From: **Prescription Medication Use Among Older Adults**

JAMA Intern Med. **2024**;184(9):1121-1123. doi:10.1001/jamainternmed.2024.2781



[a]Significant increase from 1999-2000 to 2005-2006 (slope, 1.1; P < .001). No change from 2005-2006 to 2017-March 2020 (P = .33; difference in slope, P < .001).

[b]Significant decrease from 1999-2000 to 2017-March 2020 (slope, −0.3; P = .04).

[c]Statistically significant increase from 1999-2000 to 2003-2004 (slope, 3.2; P < .001) and from 2003-2004 to 2017-March 2020 (slope, 0.4; P < .002; difference in slope, P = .05).

[d]Significant increase from 1999-2000 to 2007-2008 (slope, 0.6; P < .001). No significant change from 2007-2008 to 2017-March 2020 (P = .78; difference in slope, P < .001).

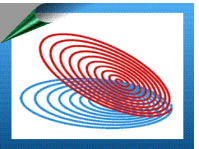
Prevalence of Polypharmacy in Elderly Worldwide

Systematic review (2024) included

"122 studies involving more than **57 million** older adults",

the largest assessments of polypharmacy prevalence worldwide

- **Global prevalence:** The pooled prevalence of
  - **Polypharmacy:** approximately **39.1% (95% CI 35.5–42.7%),** meaning that roughly **4 out of every 10 older adults** were exposed to five or more medications.
  - **Hyper-polypharmacy:** The pooled prevalence of taking **≥10 medications** was approximately **13.3%,** indicating that a substantial subgroup of older adults has a particularly high medication burden.
  - **Over-the-counter medications:** **38%**



https://pubmed.ncbi.nlm.nih.gov/39135518/ 2024

Elderly Polypharmacy Prevalence-Worldwide

Systematic review "**122 studies involving more than 57 million older adults**", the largest assessments of polypharmacy prevalence worldwide

- **Healthcare setting matters** in older adults :
  - Greater healthcare utilization,
  - Multiple chronic conditions,
  - Multi morbidity, and
  - medication burden
- **Associated factors:**
  - **≥70 years, Nursing-home** (multimorbidity & more complex treatment regimens)**, Multiple chronic conditions, Multi morbidity**

https://pubmed.ncbi.nlm.nih.gov/39135518/ 2024

Ho, ISS · Azcoaga-Lorenzo, A · Akbari, A · et al.

Variation in the estimated prevalence of multimorbidity: systematic review and meta-analysis of 193 international studies

BMJ Open. 2022; **12**, e057017

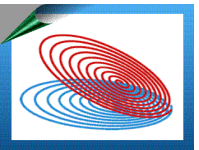
Crossref ↗ Scopus (51) ↗ Google Scholar ↗

Large systematic reviews of 193 studies of

Multi-morbidity prevalence:

- 67% in people older than 74 years,
- 47% in those aged 60–74 years and

The most common diseases in elderly with polypharmacy?

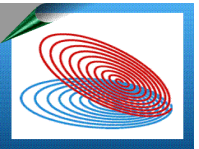


Common Drug Classes in Polypharmacy +65 years

Older adults (+65yrs) DATA on Global: JAMA-2024

1. **Cardiovascular/ HTN drugs: 68%** used at least one cardiovascular medication
2. **Dyslipidemia (statin): 43%**
3. **anti-platelet & anticoagulant : 42%**
4. **GI 26%**
4. **Metabolic agents 30%**
3. **Psychotherapy agents 30%**
6. **DM 29%**

Note: Antiplatelet and medications in geriatric lead to more adverse effects (bleeding ……. to serious hospitalization).



https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/moc.tpgtahc=ecruos_mtu?٢٨٢٠٧٢٢ 2024

Estimated Prevalence of Common Prescriptions in Polypharmacy in Geriatric

Note: Percentages are estimates derived from meta-analyses of observational studies in elderly populations.

1. **Statins (e.g., Atorvastatin): 35–45%** manage hyperlipidemia and cardiovascular risk [1].
2. **Antihypertensives (ACE Inhibitors/ARBs): 30–40%** manage chronic hypertension [2].
3. **Metformin: 20–30%** for Type 2 Diabetes management [3].
4. **NSAIDs (e.g., Naproxen): 15–25%** often contributing to adverse drug events (ADEs) [1].
5. **Diuretics (e.g., Hydrochlorothiazide): 20–25%** for fluid management/blood pressure[2].
6. **Anticoagulants (e.g., Warfarin/Apixaban): 10–15%** those with Atrial Fibrillation [4].
7. **Beta-Blockers: 15–20%** for heart failure or arrhythmia [2].
8. **SSRIs (Antidepressants): 10–15%** for comorbid depression or neuropathic pain [5].
9. **PPIs (e.g., Omeprazole): 20–30%** as a secondary prescription to prevent NSAID-induced ulcers [6].
10. **Calcium Channel Blockers: 15–20%** for hypertension management [2].
11. **Benzodiazepines:** Prescribed in **5–12**, despite high recommendations for avoidance due to fall risks [1].

Estimated Prevalence of Common Prescriptions in Polypharmacy in Geriatric

Bisphosphonates: 5–10% for osteoporosis prevention [7].

Insulin: 10–15% patients with advanced diabetes [3].

Antipsychotics: 5–8, those with cognitive impairment or dementia [5].

Sulfonylureas: 5–10%, though usage is declining due to hypoglycemia risks [3].

Gabapentinoids (e.g., Gabapentin): 5–8% for neuropathic pain [5].

Opioids: 5–10 for chronic pain management, posing high addiction and respiratory risks [1].

Antihistamines (1st Gen): 3–5%, contributing to anticholinergic burden [1].

Glucocorticoids: Used in **3–5%** for inflammatory conditions [4].

[١]American Geriatrics Society (AGS). *Beers Criteria® for Potentially Inappropriate Medication Use in Older Adults.* .(sdioipO dna ,senipezaidozneB ,sDIASN no sucoF)
[٢]Journal of Hypertension / AHA Guidelines. (Focus on ACEIs, Diuretics, and Beta-Blockers) .
[٣]American Diabetes Association (ADA). *Standards of Medical Care in Diabetes.* .(nilusnI dna nimrofteM no sucoF)
[٤]European Society of Cardiology (ESC). *Guidelines for the management of Atrial Fibrillation.* .(stnalugaocitnA no sucoF)
[٥]Journal of Clinical Psychopharmacology. (Focus on SSRIs, Antipsychotics, and Gabapentinoids) .
[٦]Gastroenterology Clinical Practice Guidelines. (Focus on PPI usage and secondary prevention) .
[٧]International Osteoporosis Foundation (IOF). (Focus on Bisphosphonates) .

A point …

Polypharmacy can be beneficial, and by itself is not the real problem

The problem is whether each drug has been prescribed

Appropriately or

Inappropriately



Polypharmacy in Elderly

Clinical sig.: Polypharmacy is important because it increase the potential of

- **Drug–drug interactions,**
- **Adverse drug reactions,**
- **Medication errors,**
- **Inappropriate prescribing,**
- **Difficulties with adherence,**
- **Use of OTC,**
- **Complementary medicine: traditional, homeopathy,……**
- **Drug-disease or drug-syndrome interactions**



https://pubmed.ncbi.nlm.nih.gov/39135518/ 2024

https://www.thelancet.com/journals/lanhl/article/PIIS2666-7568%2823%2900036-3/fulltext 2023

THE LANCET
Healthy Longevity

PERSONAL VIEW · Volume 4, Issue 5, E228-E235, May 2023
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Polypharmacy stewardship: a novel approach to tackle a major public health crisis

Ruth Daunt, MB MRCPI [a] · Denis Curtin, PhD MRCPI [a] · Prof Denis O'Mahony, MD FRCPI [a]

Affiliations & Notes · Article Info · Linked Articles (1)

	Community-dwelling adults	Hospitalised patients	Nursing home residents
STOPP/START, version 2, 2015	66·8%[31]	68·5–86·1%[9,32]	64·8–86·5%[33,34]
Beers Criteria, American Geriatrics Society, 2015	54·0%[31]	21·6–71·5%[35,36,32]	51·1–92·4%[37,38]

Table

Estimated prevalence of potentially inappropriate prescribing in older people in different care settings, by criteria

STOPP=Screening Tool of Older Persons' Prescriptions. START=Screening Tool to Alert to Right Treatment.

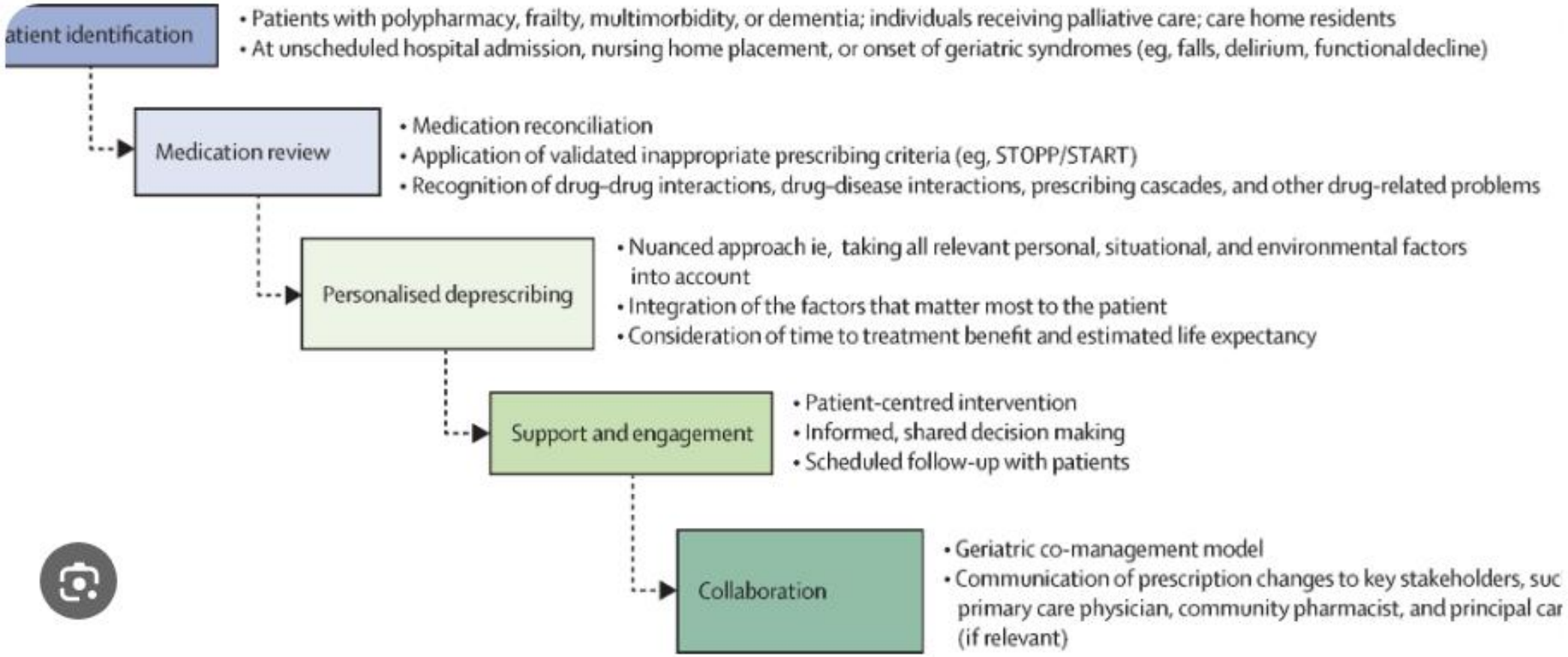
WHO estimates that mismanaged accounts for approximately **4% of the world's total avoidable health-care costs**.

Polypharmacy medication review: Lancet 2023

Patient groups most likely to benefit of medication review:

- Residents in a care home setting
- Patients taking high-risk medications
  - **(eg, anticoagulants, immunosuppressive agents)**
- Patients with polypharmacy (and specially ≥10 daily medications)
- Patients with multi-morbidity
- Patients with measurable frailty
- Patients with dementia
- Patients receiving palliative care
- Onset of geriatric syndrome: fall, dellirum, function loss

https://www.thelancet.com/journals/lanhl/article/PIIS/۳-۲۹۰۰۰۳۶%۲۸۲۳%۷۵۶۸-۲۶۶۶fulltext



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Polypharmacy in Elderly Worldwide

- **Main implication:** The authors emphasize the need for
  - **Regular medication review,** “having a healthcare provider review the patient’s medical record, go over the drugs with them” “Intensive, face-to-face interventions”
  - **De-prescribing when appropriate, “** important role a pharmacist: simple consult with a pharmacist**” and**
  - **Individualized medication management** in older adults rather than simply attempting to reduce the number of medications, “Patients might not consider over-the-counter drugs as actual medications”.

“The more tools we develop to help assess the risk-benefit of medications for our patients, the better care we can give them,” .

https://www.thelancet.com/journals/lanhl/article/PIIS2666-7568%2823%2900036-3/fulltext

Economic burden of polypharmacy

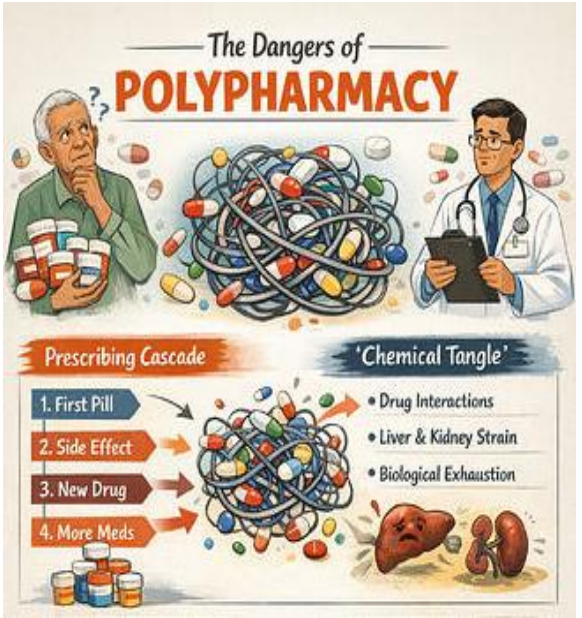
Higher healthcare costs;

Healthcare costs of patients with polypharmacy are **2 times higher** those of patients without polypharmacy

https://www.bmj.com/content/٠٧٤٨٩٢-٢٠٢٣-jmb/٣٨٥

Economic interpretation in UK 2023 Lancet:
Of the estimated **£396 million in annual healthcare costs** associated with medication-related harm, approximately **£243 million** was considered potentially **preventable.**

61% of the estimated annual cost



https://pmc.ncbi.nlm.nih.gov/articles/PMC/٦٠٤٦٤٨٩

Economic burden of polypharmacy

Older adults report –BMJ 2023

- **85%:** willing to de-prescribe their drug treatment, based on provider recommendations.
- **67%:** wanting to reduce the number of drug treatments they are taking

1. Expenditure on unnecessary, inappropriate, or low-value medications.
2. Costs of adverse drug reactions: Treatment of complications of drug interactions.
3. Hospitalization costs: **Emergency** department visits, hospital **admissions**, and **readmissions**.
4. Long-term care costs: falls, functional decline, loss of independence.
5. Indirect costs: caregiver burden, loss of independence, family care requirements.

https://www.bmj.com/content/٠٧٤٨٩٢-٢٠٢٣-jmb/٣٨٥

GP & Preventing/Managing polypharmacy in Older Adults

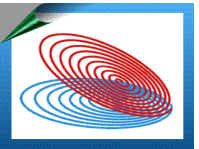
General practitioners (GPs) have **a central role** in addressing this challenge because they often serve as the primary point of contact between patients, specialists, pharmacists, and other healthcare professionals

coordinate long-term care & prescribe medications

Common Drug Classes in Polypharmacy +65 years

DATA Iran: dataset covering 38% of the +65yrs (n= 1 876 527 in 24 provinces:

- 74.9% experienced cumulative polypharmacy over 6 months and 64.6% over 1 month, with 7.6% experiencing consecutive polypharmacy.
- Females and those aged 75–79 were more prone to polypharmacy.
- commonly used medications:
  - Systemic glucocorticoids (50.02%),
  - HMG-CoA reductase inhibitors (42.73%) and
  - platelet aggregation inhibitors (41.92%).
- Polypharmacy strongly associated: GI tract and metabolism, cardiovascular system, nervous system and blood and blood-forming organs.



https://bmjopen.bmj.com/content/15/8/e097863?utm

IJNR 2022, 17(5): 71-87

Polypharmacy Management Strategies in Older Adults; A scoping review

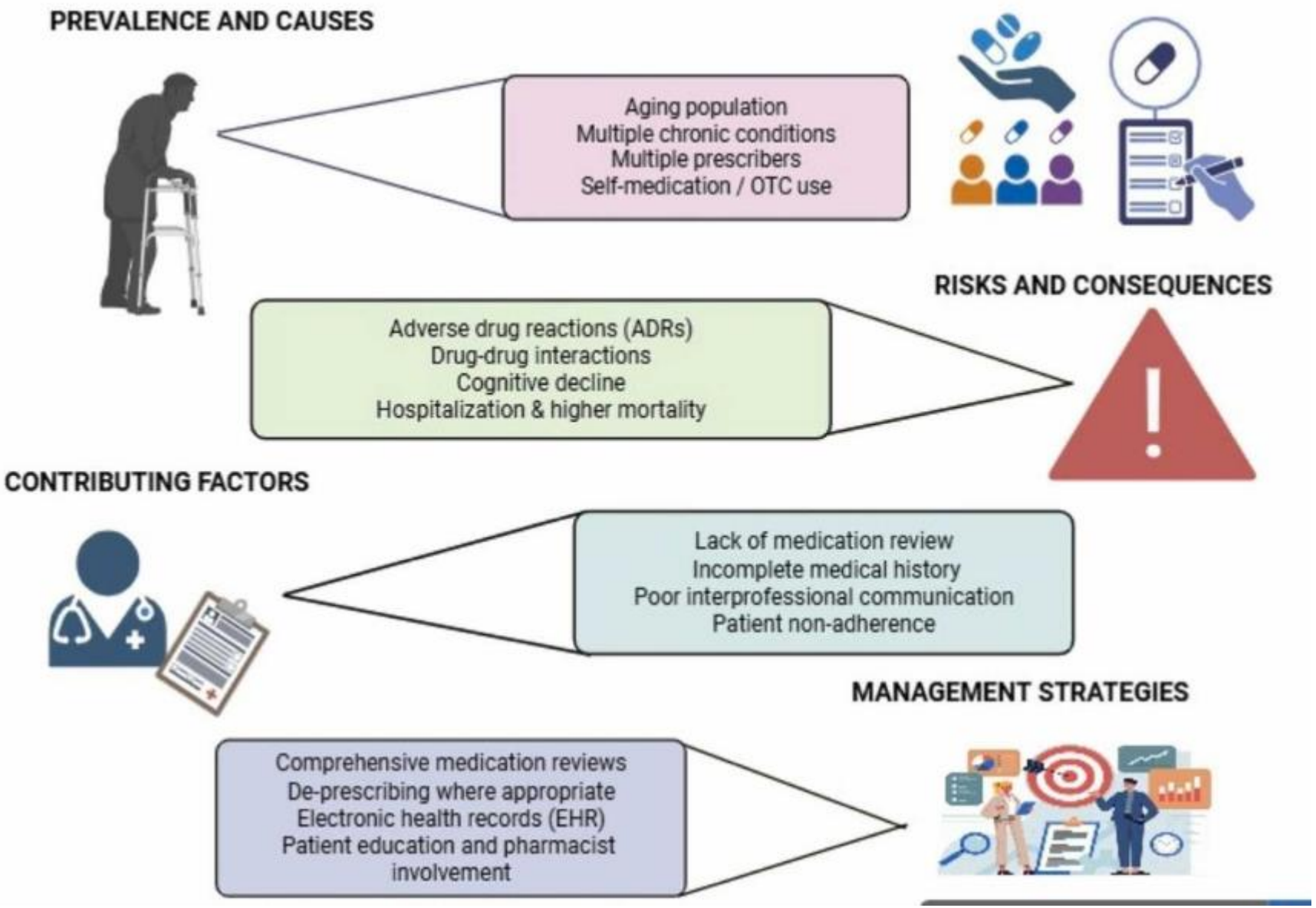
Hossein Poorcheraghi, Nasrin Valieiny, Shahzad Pashaeypoor *, Fatemeh Sadat Mirzadeh

Tehran University of Medical Sciences , Pashaeypoor.sh@gmail.com

Strategies that Surprisingly reduce the number of medications (Iran):

- Physician-pharmacist interaction,
- Educating the elderly about self-medication hazards,
- Informing the elderly about herbal medicine limitations,
- Using electronic tools to monitor the process of drug use, and
- Using protocols and guidelines for prescribing

https://ijnr.ir/article--۲۶۹۵-۱en.html 2022





https://www.sciencedirect.com/science/article/pii/S3050837125000062 2025

سناریوی بیمار (وضعیت پلی‌فارمیسی)، استراتژی Deprescribing

گام ۱: ارزیابی ضرورت (Necessity Check)

- پزشک/داروساز بررسی می‌کند: آیا بیمار واقعاً به همه این‌ها نیاز دارد؟
- *مثال:* آیا درد آرتریت خانم با روش‌های غیردارویی (فیزیوتراپی یا گرم کردن موضعی به جای ناپروکسن) قابل کنترل است؟

گام ۲: اولویت‌بندی حذف (Prioritization)

- داروهایی که **بیشترین خطر (High Risk)** را دارند اما **کمترین منفعت** را می‌رسانند، در اولویت حذف قرار می‌گیرند. (مثل حذف بنزودیازپین ها در بیخوابی و توصیه های بهداشت خواب)

گام ۳: جایگزینی ایمن (Substitution)

- به جای حذف کامل، از داروهای با پروفایل ایمنی بهتر استفاده می‌شود. (مثل استامینوفن به جای ناپروکسن اگر بیمار وارفارین مصرف می کند)

گام ۴: مشارکت، آموزش بیمار و خانواده

سناریوی بیمار (وضعیت پلی‌فارمیسی)

- **بیمار:** خانم ۸۲ ساله، با تشخیص چند بیماری:
- **آرتریت:** مصرف *ناپروکسن* (NSAID - ضدالتهاب غیراستروئیدی) برای کاهش درد
- **فشار خون بالا:** مصرف *انالاپریل* (ACE Inhibitor)
- **کم‌خونی:** قرص آهن
- **مشکلات قلبی:** مصرف *وارفارین* (Anticoagulant - ضد انعقاد خون)
- **بی‌خوابی:** مصرف *دیازپام* (Benzodiazepine - آرام‌بخش)

سناریوی بیمار (وضعیت پلی‌فارمیسی) .....



تداخلات و خطرات:

- **تداخل ۱ (ناپروکسن + وارفارین):**

افزایش شدید خطر خونریزی گوارشی

- **تداخل ۲ (ناپروکسن + انالاپریل):**

کاهش اثر داروهای فشار خون و افزایش خطر آسیب به کلیه

- **تداخل ۳ (دیازپام + سن):** افزایش خطر سقوط، شکستگی لگن و اختلال شناختی در سالمندان (به دلیل نیمه‌عمر طولانی).

سناریوی بیمار (وضعیت پلی‌فارمیسی) .....

خلاصه تغییرات (قبل و بعد)

دارو	وضعیت قبل	وضعیت بعد (اصلاح شده)	علت اصلاح
ناپروکسن	مصرف روزانه	حذف شد	خطر خونریزی و آسیب کلیوی
دیازپام	مصرف شبانه	حذف شد	خطر سقوط و اختلال حافظه
وارفارین	مصرف روزانه	ادامه مصرف	ضرورت برای پیشگیری از لخته
انیلاپریل	مصرف روزانه	ادامه مصرف	مدیریت فشار خون
استامینوفن	عدم مصرف	اضافه شد	جایگزین ایمن برای کنترل درد

نتیجه نهایی: تعداد داروها از ۴ مورد به ۳ مورد کاهش یافت، اما **کیفیت زندگی و ایمنی بیمار به شدت افزایش یافت.**

سناریوی بیمار (وضعیت پلی‌فارمیسی)، روش اصلاح:.....

گام ۱: ارزیابی ضرورت (Necessity Check)

- پزشک یا داروساز بررسی می‌کند: آیا بیمار واقعاً به همه این‌ها نیاز دارد؟
- *مثال:* آیا درد آرتریت خانم با روش‌های غیردارویی (فیزیوتراپی یا گرم کردن موضعی) قابل کنترل است؟

گام ۲: اولویت‌بندی حذف (Prioritization)

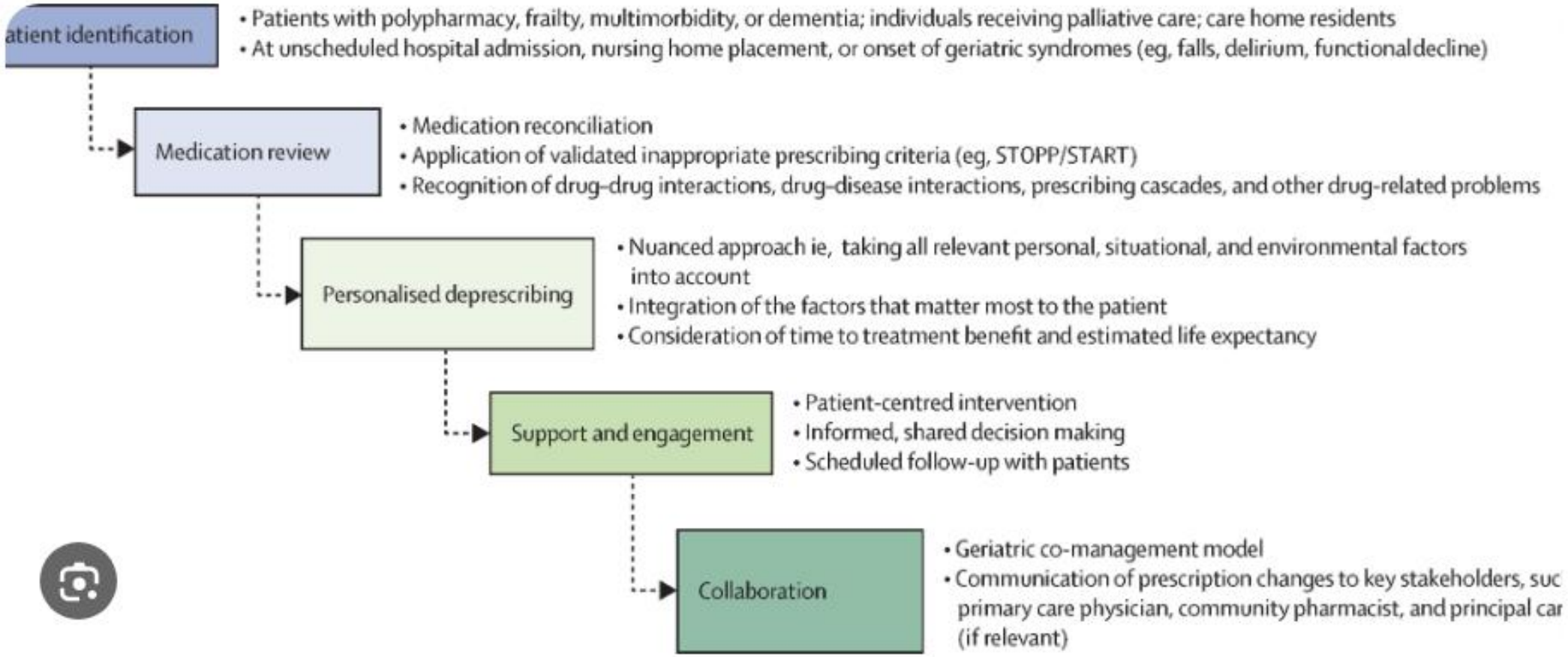
- داروهایی که بیشترین خطر (High Risk) را دارند اما کمترین منفعت را می‌رسانند، در اولویت حذف قرار می‌گیرند.

- **اولویت اول حذف: دیازپام**. (چون خطر مرگ و سقوط در سالمند بسیار بالاست و برای بی‌خوابی مزمن، گزینه‌های ایمن‌تری وجود دارد).
- **اولویت دوم حذف: ناپروکسن**. (به دلیل تداخل خطرناک با وارفارین و فشار خون).

گام ۳: جایگزینی ایمن (Substitution) با مشارکت، آموزش بیمار و خانواده

- به جای حذف کامل، از داروهای با پروفایل ایمنی بهتر استفاده می‌شود.

- **جایگزین برای درد:** استفاده از *استامینوفن* (با دوز کنترل شده) یا درمان‌های فیزیکی (به جای ناپروکسن).
- **جایگزین برای بی‌خوابی:** اصلاح سبک زندگی یا استفاده از داروهای با نیمه‌عمر بسیار کوتاه که تجمع نمی‌کنند (تحت نظر دقیق).



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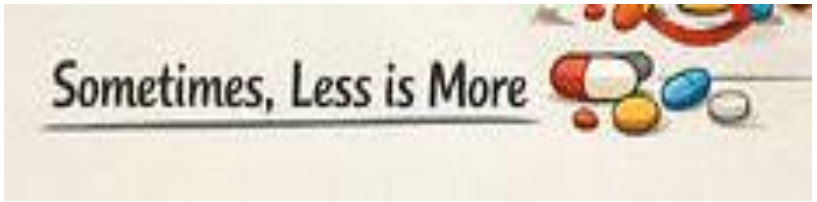
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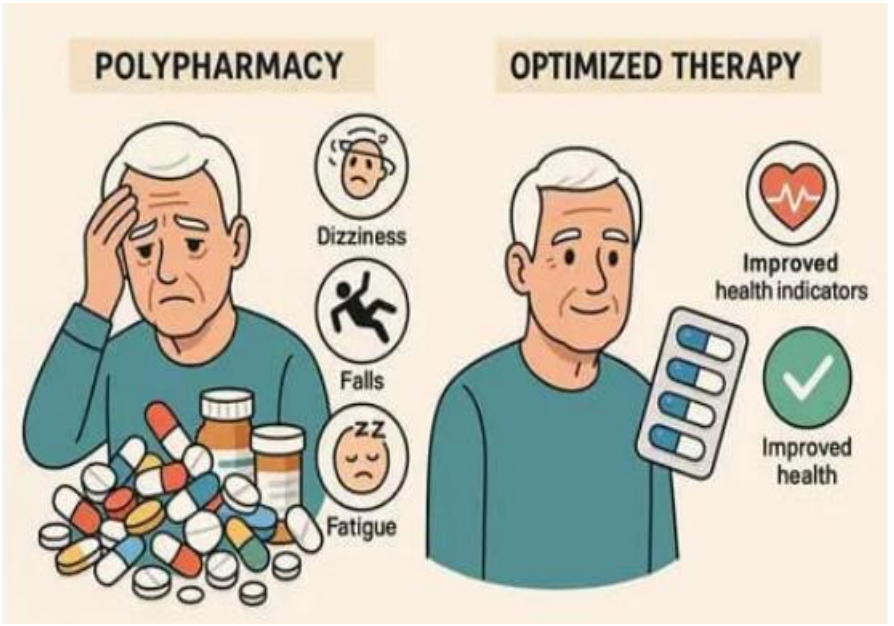
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Massage takeaway







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